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| 10/501,845 | 08/26/2005 | Martin Vorbach | 2885/86 | 9148 |
| 26646 7590 03/15/2010 KENYON & KENYON LLP ONE BROADWAY NEW YORK, NY 10004 | | | | |
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| VICARY, KEITH E | | | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/501,845

Applicant(s)

VORBACH ET AL.

Examiner

KEITH VICARY

Art Unit

2183

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-13, 15-17 and 19-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-13, 15-17 and 19-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB06)
Paper No(s)/Mail Date See Continuation Sheet
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Continuation of Attachment(s) 3. Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :12/15/2009, 2/10/2010 (first), 2/10/2010 (second).

DETAILED ACTION

1. Claims 7-13, 15-17, and 19-22 are pending in this examination and presented for examination. Claims 7 and 10 are currently amended by an amendment filed 2/9/2010.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 7, 10-11, 15-17, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (Smith) (US 6658564 B1) in view of Dockser (US 5860119) in view of Borkenhagen et al. (Borkenhagen) (US 6076157).
4. Consider claim 7, Smith discloses providing a program corresponding to a sequence of compilable high-level language instructions (col. 10, lines 49-50, high-level design specification or algorithm); determining, for the reconfigurable field of data processing cells (col. 8, lines 52-53, programmable logic resources), a set of configurations of the reconfigurable field of data processing cells, with respect to at least one of a function and an interconnection of the reconfigurable field of data processing cells, with execution of which configurations the program is run (col. 11, lines 60-63, compiling hardware functions into configuration patterns using a hardware description language compiler); executing the configurations (col. 10, lines 50-51, executing on a reconfigurable hardware architecture); and during the executing: storing, in the data

stream memory, at least one of the data stream and parts of the data stream (col. 4, lines 22-33, disclose of the random-access memory devices, it is inherent that they may be written to, the data with which it is written constitutes all or part of a data stream), wherein the data stream memory stores at least one vector (it is inherent that a data stream memory holds vectors of bits, such as each addressable line).

However, Smith does not explicitly disclose that the data stream memory is a register which is operated as a FIFO memory. Smith also does not disclose determining, for each of the configurations, a respective maximum allowed execution runtime prior to lapse of which the respective configuration is uninterruptible, and for each configuration, monitoring the respective maximum allowed execution runtime in order to interrupt processing with the configuration if the respective maximum allowed execution runtime is exceeded.

On the other hand, Dockser does disclose a register which is operated as a FIFO memory to process a data stream (e.g. col. 12, line 16-17, FIFO registers).

It would have been readily recognized to one of ordinary skill in the art at the time of the invention that one of many motivations of having a register act as a memory would be to allow quick access to data, and a FIFO buffer preserves order of incoming data (Dockser, col. 1, lines 63-65). In addition, Dockser makes a FIFO system both simple and inexpensive to implement (Dockser, col. 4, lines 6-40), despite decreases in management overhead.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teaching of Dockser with the invention of Smith in

order to allow quicker access to the data stream while preserving order of incoming data in a simple and inexpensive manner.

However, neither Smith nor Dockser disclose determining, for each of the configurations, a respective maximum allowed execution runtime prior to lapse of which the respective configuration is uninterruptible, and for each configuration, monitoring the respective maximum allowed execution runtime in order to interrupt processing with the configuration if the respective maximum allowed execution runtime is exceeded.

On the other hand, Borkenhagen does disclose of determining, for each thread (col. 14, lines 65-67, each thread need not have the same thread switch time-out value), a respective maximum allowed execution runtime (col. 15, line 1, thread switch time-out value) prior to lapse of which a respective thread is uninterruptible (col. 14, line 45-48 discloses of the use of the time-out register so that an external interrupt is serviced within a limited period of time; thus the interrupt is not serviced until the time-out register indicates a time-out and not before), and for each thread, monitoring the respective maximum allowed execution runtime in order to interrupt the thread if the respective maximum allowed execution runtime is exceeded (col. 15, lines 1-7, thread switch time-out value is decremented, and when it is determined to equal zero, a thread switch is forced).

Borkenhagen's teaching of interrupting after the maximum allowed execution runtime prevents processor hangs (Borkenhagen, col. 5, lines 35-37). It would also be readily recognized that the use of different thread switch time-out values for different

threads increases flexibility, and interrupting only after the time-out enables forward progress.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teaching of Borkenhagen with the invention of Smith and Dockser in order to prevent processor hangs in a flexible manner while enabling forward progress. Note that the overall combination results in Borkenhagen's specific thread switching policy being applied to Smith's configurations (and Smith's generic configuration switching policy) to result in an overall specific configuration switching policy.

5. Consider claim 10, Smith discloses that the register is a RAM PAE (col. 4, lines 22-33, disclose of the random-access memory devices).

6. Consider claim 11, the combination of Smith, Dockser, and Borkenhagen discloses using the register to provide read and write access (Dockser, col. 4, lines 32-35, receive mode and transmit mode, and col. 5, lines 56-65, read and write pointers) when a virtual FIFO dividing line is implemented (Dockser, col. 3, lines 10-30, lines 54-56; the last word flag and end-of-packet detection means correlate to the said virtual FIFO dividing line), wherein the program includes a multitask application, and a register is used for execution of at least one of two different tasks of the multitask application (Smith and Borkenhagen discloses of multitasking as cited in the independent claim; alternatively, multiple tasks within a thread).

7. Consider claim 15, Borkenhagen discloses a watchdog is used to recognize an exceedance of each respective maximum allowed execution runtime (col. 15, lines 1-3, thread switch time-out values from the thread switch time-out register forces a thread switch).
8. Consider claim 16, Borkenhagen discloses that any one of the configurations that exceeds its respective maximum allowed execution runtime is treated as illegal (col. 15, lines 1-3, thread switch time-out values from the thread switch time-out register forces a thread switch; thus it is illegal for the first thread to continue executing).
9. Consider claim 17, Borkenhagen discloses that any one of the configurations that exceeds its respective maximum allowed execution runtime is treated as illegal (col. 15, lines 1-3, thread switch time-out values from the thread switch time-out register forces a thread switch; thus it is illegal for the first thread to continue executing).
10. Consider claim 19, Smith and Borkenhagen discloses an operating system performs a predefined step in response to an exceedance by a configuration of the configuration's maximum allowed execution (Borkenhagen, col. 15, lines 1-19, thread switch time-out values forces a thread switch; col. 17, lines 41-42, operating system; Smith discloses in col. 8, lines 26-27, 52-53, discloses of operating systems allocating programmable logic resources to functions).

11. Consider claim 20, Smith discloses at least one of the configurations calls another of the configurations as a sub-routine (col. 12, lines 1-5 for example, a main function calls a dynamically-linked function).
12. Consider claim 21, Borkenhagen discloses the watchdog signal initiates a system trap (col. 15, lines 1-3, thread switch time-out values from the thread switch time-out register forces a thread switch; in other words, the thread is interrupted by the thread switching system).
13. Consider claim 22, Smith and Borkenhagen discloses, in response to the system trap, an operating system performs steps defined for a response to an invalid instruction (Borkenhagen, col. 15, lines 1-19, thread switch time-out values forces a thread switch; col. 17, lines 41-42, operating system; Smith discloses in col. 8, lines 26-27, 52-53, discloses of operating systems allocating programmable logic resources to functions).
14. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith, Dockser, and Borkenhagen as applied to claim 7 above, and further in view of Panwar et al. (Panwar) (US 5941977).
15. Consider claim 8, Smith, Dockser, and Borkenhagen do not disclose at least one: i) of a register allocation device to allocate the register, and ii) a register releasing device to release the register.

On the other hand, Panwar does disclose at least one: i) of a register allocation device to allocate the register, and ii) a register releasing device to release the register (col. 7, lines 31-39, register window allocation and col. 7, lines 54-64, register management).

Panwar's teaching enables processes to access registers independent of other processes executing within the processor (Panwar, col. 7, lines 35-38).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teaching of Panwar with the invention of Smith, Dockser, and Borkenhagen in order to access registers independent of other processes executing within the processor.

16. Consider claim 9, Panwar discloses that the register allocation device is preserved over multiple reconfigurations of the reconfigurable field of data processing cells (col. 2, lines 25-42, col. 6, lines 32-36, col. 7, lines 31-39 and 54-64; the multithreading aspect in which each thread has its corresponding registers conserved correlates to the different reconfigurations as per Smith's correlation between configurations and threads as explained above).

17. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith, Dockser, and Borkenhagen as applied to claim 7 above, and further in view of Davis et al. (Davis) (US PAT 4041462).

18. Consider claim 12, Smith, Dockser, and Borkenhagen do not explicitly disclose at least one memory unit configured for use as a stack and being configured to indicate at least one of a stack underflow state and a stack overflow state.

On the other hand, Davis does disclose at least one memory unit configured for use as a stack and being configured to indicate at least one of a stack underflow state and a stack overflow state (col. 14, lines 1-4, limit checking facilities which test for overflow and underflow, and lines 21-32, PSW)

It would have been readily recognized to one of ordinary skill in the art at the time of the invention that stacks in general are an easily implemented method of dynamic allocation of storage space for data, and a simple efficient mechanism for enqueueing data and/or parameters.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the stacks of Davis with the invention of Smith, Dockser, and Borkenhagen in order to easily implement a method of dynamic allocation of storage space for data, and efficiently enqueue data and/or parameters.

19. Consider claim 13, the claim is rejected for the same reasons as claim 12 above. In addition, Davis discloses the at least one of the underflow state and overflow state is of an operating system unit (col. 14, lines 1-4 and lines 21-32; also, note the PSW is typically accessed by the operating system).

Response to Arguments

20. Applicant on page 6 first appropriately characterizes the Borkenhagen reference as referring to a maximum runtime for a thread, and not for a configuration. Applicant then argues that Smith's teaching of a configuration and of a thread would not suggest applying Borkenhagen's teaching of a maximum runtime to a configuration; this argument is addressed below.

21. Applicant on page 7 first argues in large part via a first footnote that the "thread" in the context of Borkenhagen does not fundamentally correlate to the "thread" in the context of Smith. Specifically, applicant notes that threads in Borkenhagen are parts of a program that can be executed independently of each other, whereas in Smith, threads refer are compiled from software functions. However, the two different characterizations of "threads" are not mutually exclusive; in contrast, the use of the term "threads" by Smith appears to convey that the instances of object code which are compiled from respective software functions are parts of a program that can be executed independently of each other, thus being appropriately labeled threads. Examiner also generally objects to applicant's second recitation of the generally accepted definition of threads in the footnote. Specifically, examiner does not believe that a generally accepted definition of thread mandates that a thread is necessarily compiled object code. Additionally, examiner believes that in instances where a thread is compiled object code, it is not mandatory that threads must be groups of such compiled object code.

Applicant continues the argument in the first footnote by arguing that nothing in the Smith reference explains why threads are pertinent to its subject matter, if the term is intended by the Smith reference according to the generally accepted definition.

Disregarding inconsistencies in scope between the two given generally accepted definitions, examiner notes that Smith does provide the context to why the term "threads" is in accordance with the general concept of threads being independently executable parts of a program. As one example, Smith discloses of compiling software functions into threads (col. 11, lines 59-60) and of multitasking functions that are independently executable (e.g. col. 8, lines 35-41). Therefore, multitasked functions, when the functions are executed via software, correlate to multitasked threads.

22. Applicant argues on page 7 that, thus, there is no one-to-one correspondence of a thread to a configuration, and the reference to a forced thread switch after some time in the Borkenhagen reference in no way suggests a forced configuration switch after some time.

However, Smith discloses that a function can be executed either in software or hardware (e.g. col. 7, lines 7-8). Functions executed in software are compiled into threads, and functions executed in hardware are compiled into configurations (e.g. col. 11, lines 59-63). Thus, there is a correspondence between the threads and configurations: each performs the function, albeit one in software and one in hardware. In contrast to what is argued in the second footnote, the Smith reference does refer to threads in its usual sense akin to the Borkenhagen reference, as explained above. It

would be readily recognized to one of ordinary skill in the art at the time of the invention that the motivation of Borkenhagen is applicable and beneficial regardless of whether functions are executed in software or hardware.

Examiner notes that Smith discloses that a typical scheduling system for a reconfigurable computer may use a time-multiplexing system in which programmable logic resources may be allocated to application functions and which may involve switching between different functions at predetermined time periods (col. 8, line 66 through col. 9, line 4). Therefore, applicant's contention that one of ordinary skill in the art would only apply multitasking teachings to threads and not to configurations is inaccurate at least because Smith already does so, though as examiner has pointed out, the correlation between the threads and configurations would be enough to motivate the combination. Nevertheless, it is Borkenhagen's multitasking policy in particular which examiner is applying to Smith. Again, given that Smith not only correlates threads to configurations but also teaches of applying the multitasking aspect of threads to configurations, one of ordinary skill in the art at the time of the invention would recognize that Borkenhagen's specific multitasking policy would not only be applicable to threads but also to configurations, given that the goal of the policy to prevent processor hangs is applicable regardless of whether the program which is hanging is being executed in software or hardware. The execution of functions in hardware (e.g. to provide faster execution times as per Smith, col. 1, lines 46-47) does not nullify the benefit of Borkenhagen's teaching. It would be readily recognized that an explicit recitation that any general modification that one can do to threads, one can

likewise do to configurations, is not necessary for the aforementioned combination to nevertheless be proper.

23. Applicant argues on page 7 that Borkenhagen does not disclose or suggest any such maximum runtime, but instead provides for a thread switch only if an active thread does not perform any processing for some time.

However, Borkenhagen does disclose of a maximum runtime (col. 15, lines 1-19, thread switch time-out values forces a thread switch). Moreover, this thread switch occurs regardless of whether an active thread does or does not perform any processing for some time (e.g. col. 15, lines 3-5, the decrement register is decremented once each cycle until the decrement register value equals zero). Examiner notes that applicant's characterization of Borkenhagen to only provide for a thread switch only if an active thread does not perform any processing for some time is presumably taken from the background of the invention section (specifically, col. 3, lines 63-66), and is a distinct embodiment from the citation which examiner has relied upon in the rejection.

Examiner again notes that Borkenhagen was not relied on solely to teach of a maximum runtime, as Smith discloses in col. 8, line 67, of a time-multiplexing system.

Conclusion

24. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH VICARY whose telephone number is (571)270-1314. The examiner can normally be reached on Monday - Thursday, 7:00 a.m. - 5:30 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on 571-272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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